

**(12) UK Patent Application (19) GB (11) 2 193 143 (13) A**

(43) Application published 3 Feb 1988

<p>(21) Application No <b>8618616</b></p> <p>(22) Date of filing <b>30 Jul 1986</b></p>	<p>(51) INT CL<sup>4</sup> <b>B29C 33/56 43/18 45/14</b></p> <p>(52) Domestic classification (Edition J): <b>B5A 1R314C1F 1R314C5 1R314C6 1R400 1R411 1R422 1R424 1R439X 20T14 20T1 2H13 D20</b></p> <p>(56) Documents cited <b>GB A 2158390 EP A2 0004406 EP A1 0001865</b></p> <p>(58) Field of search <b>B5A</b> <b>Selected US specifications from IPC sub-class B29C</b></p>
<p>(71) Applicant <b>Litholite Mouldings Limited</b>  <b>(Incorporated in United Kingdom)</b>  <b>Peckleton Common, Earl Shilton, Leicester LE9 7RG</b></p> <p>(72) Inventor <b>Terence Douglas Grive</b></p> <p>(74) Agent and/or Address for Service <b>Graham Jones &amp; Company,</b> <b>77 Beaconsfield Road, Blackheath, London SE3 7LG</b></p>	

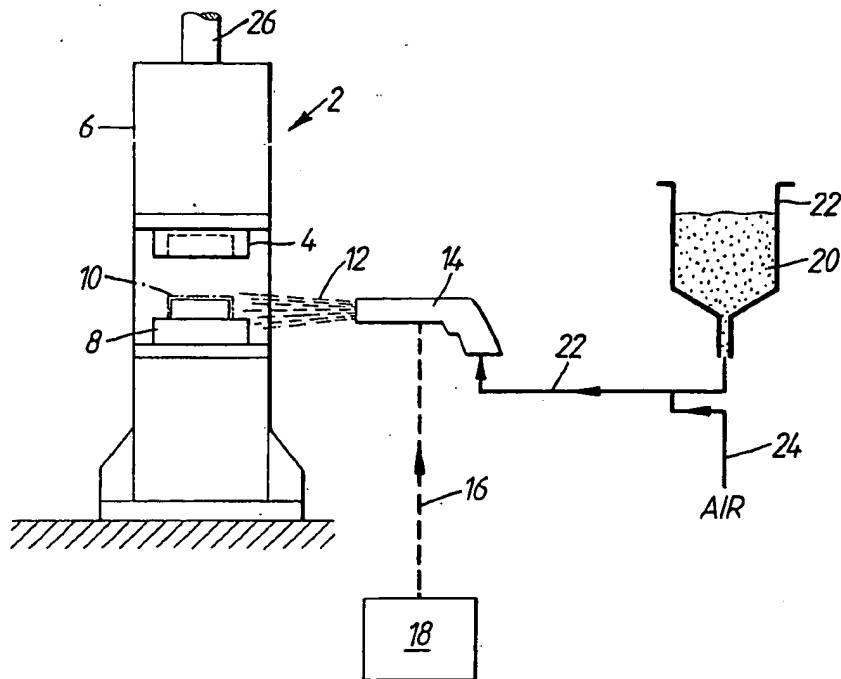
**(54) A moulded unsaturated resin article**

**(57) A moulded article which is free from surface blemishes is moulded from an unsaturated resin composition, the mould surface being provided with a coating of a powder mould coating material, and the unsaturated resin composition being able to be moulded at a low pressure.**

**GB 2 193 143 A**

1/1

2193143



## SPECIFICATION

## A moulded article

- 5 This invention relates to a moulded article and it relates more especially to a moulded article which is moulded from an unsaturated resin composition such for example as a dough moulding compound.
- 10 Moulded articles from unsaturated resin compositions are well known. When such known articles are moulded solely from an unsaturated resin composition, the surface of the articles may be blemished with imperfections
- 15 such as micro-porosity, hair cracks and microvoids. These blemishes prevent moulded articles made solely from the unsaturated resin composition from being used in applications where aesthetic appearance is important. In
- 20 order to overcome this problem, it is known to employ a coating of a powder coating material, this coating being able to give the moulded article a good surface finish.
- Although moulded articles which have been
- 25 moulded from an unsaturated resin composition and which have been provided with a coating of a powder mould coating material have been known for some years, difficulty has been encountered in producing relatively
- 30 large moulded articles due to the high moulding pressures often required by the unsaturated resin composition. The high pressure dough moulding compound may require very large presses in order to produce moulded
- 35 articles in excess of 50 cm square and such large presses involve much capital expenditure and, in addition, take up much factory floor space.
- It would be a considerable advantage if a
- 40 moulded article could be produced from an unsaturated resin composition with a coating of the powder mould coating material, but which article did not require such high pressures as has hitherto been necessary. It is an
- 45 aim of the present invention to provide such an advantage and this has been achieved by the discovery that there has recently become available an unsaturated resin composition which can be moulded at low pressures. This
- 50 unsaturated resin composition which can be produced at low pressures has not to our knowledge been used with a coating of a powder mould coating material and no one has apparently previously realised that the low
- 55 pressure unsaturated resin composition may be used in applications that have previously been solely reserved for the high pressure unsaturated resin compositions.
- Accordingly, this invention provides a
- 60 moulded article which is moulded from an unsaturated resin composition and which is provided with a coating of a powder mould coating material, the unsaturated resin composition being an unsaturated resin composition which
- 65 is able to be moulded at a low pressure.

- Preferrably, the unsaturated resin composition is a dough moulding compound, a sheet moulding compound, or a bulk moulding compound. The article will usually be formed by
- 70 hot press moulding or by injection moulding.
- The unsaturated resin composition may be a polyester unsaturated resin composition.
- The polyester unsaturated resin composition may comprise solid polyester resins blended
- 75 with styrenated polyesters.
- The solid polyester resins can be supplied as dry, free flowing granules. Suitable polyester resins are those known as Crystic 770 (Crystic being a registered trade mark). Suitable styrenated polyesters are those known as
- 80 Crystic 775.
- The Scott Bader Company Limited produce a suitable low pressure unsaturated resin composition under the name Crystic Impreg.
- 85 The unsaturated resin composition may include desired ingredients such for example as reinforcing materials, additives, fillers and catalysts. Any suitable additives, fillers and catalysts may be employed. Thus, for example,
- 90 the additives may be shrink control additives. By way of example, it is mentioned that a suitable low pressure unsaturated resin composition may comprise Crystic 770, Crystic 775, bakelite LP 40 A, zinc stearate, millicarb,
- 95 TBPB and styrene.
- Unsaturated resin compositions may contain an unsaturated polymer, a vinyl monomer and a thickener, the thickener being a crystalline polyester. The glycol of the crystalline polyester may be neopentyl glycol, 1,6-hexanediol
- 100 or 1,4-cyclohexanedimethanol.
- At least a part of the acid of the crystalline polyester may be fumaric acid. At least a part of the acid may be a symmetrical aromatic
- 105 saturated dicarboxylic acid.
- The amount of crystalline polyester present in the composition may be from 10 to 50% by weight of the total weight of the composition.
- 110 The unsaturated polymer may be a polyester, a vinyl ester polymer or a urethane acrylate.
- The powder mould coating material may be one or more unsaturated polyester resins.
- 115 The powder mould coating material may be supplied in pigmented, clear and glass bead reinforced versions.
- The powder mould coating material may comprise unsaturated polyester resin, DAP prepolymer and a poly-unsaturated cross-linking agent.
- 120 The powder mould coating material may be that manufactured and sold by the Dutch company Synres Internationaal B.V. or their associate Dutch company Synres-Almoc B.V.
- 125 The moulded articles of the present invention may be produced at pressures of, for example, 250 lbs./sq.ins. as against a moulding pressure for a normal dough moulding compound of 1-2 tons/sq.ins. for the pro-
- 130

duction of the same type of article.

An embodiment of the invention will now be described solely by way of example and with reference to the accompanying drawing which shows an article in the form of a tray being provided with a coating of a powder mould coating material, prior to being finally moulded.

Referring to the drawing, there is shown moulding apparatus 2 comprising a fume cover 4 which is adapted to be raised and lowered in a tubular housing 6. The tubular housing 6 contains a mould part 8 for moulding an article 10 to shape.

The moulded article 10 is made from a substrate of a low pressure unsaturated resin composition such as has been mentioned above. Prior to final moulding, the mould part 8 is sprayed with a spray 12 of a powder mould coating material, the spray being effected from an electrostatic spray gun 14. The spray gun 14 is supplied with voltage along line 16 from a high voltage generator 18. The spray gun 14 receives powder mould coating material 20 from a hopper 22. The powder mould coating material passes along a line 22 where it is mixed with air from a line 24.

The use of the powder mould coating material eliminates finishing operations that would otherwise be necessary in the article 10, such as filling and sanding of pinholes.

Pigmentation of the powder mould coating material may be as desired. Usually, the powder mould coating material will be electrostatically sprayed on to a hot mould surface, prior to introducing the low pressure moulding compound. Immediately after the powder mould coating material touches the mould, it melts, flows, forms a film and polymerizes. After about 20 seconds, the coating may have cured sufficiently and it may have enough strength to withstand the flow forces of the low pressure unsaturated resin composition during the moulding process to form the article 10. After the low pressure unsaturated resin composition has been placed on the coated mould and the mould has been closed, a normal curing cycle may be started. No additional curing time should be necessary.

As the powder mould coating material is electrostatically sprayed from the gun 14, it will stick to either the upper or the lower mould half. The thickness can be regulated on each part of the mould, including vertical sections.

The mould may be at a temperature of, for example, 120—160°C. After the completion of the curing cycle, the moulded article 10 will release easily. If desired, ejector systems can be used. The spray gun 14 can be operated manually or automatically.

The powder mould coating material may be provided in various thickness, depending upon the moulded article to be produced and its

intended use. By way of example, it is mentioned that the moulded article produced may be garden furniture such for example as table tops, chairs and benches. Agricultural equipment may be produced such for example as covers for lawn mowers and hoppers. Other articles that may be produced are housings for telecommunications equipment, covers for electrical switching cabinets, letter boxes, building products, seats, leisure products, vehicle components, filing cabinets, door handles, oven doors, swimming pool lockers, and boots and bonnets for cars. The articles can be produced flat or with curves. Generally, curved articles will be stronger than flat articles. Also, generally, the articles can be produced in any desired shapes and sizes, and in any desired colours.

It is to be appreciated that the embodiment of the invention described above with reference to the accompanying drawings has been given by way of example only and that modifications may be effected. Thus, for example, if it is desired to prevent the mould edge from becoming covered with the powder mould coating material, then the use of an appropriate mask may be employed. Any known type of electrostatic spray equipment may be employed. The output voltage of the electrostatic spray equipment may be approximately 60kV negative, whilst the moulding equipment should be earthed. The amount of air required for the powder delivery along line 22 will depend upon the spraying equipment used and the mould configuration. The moulding apparatus 2 should preferably include an effective exhaust system provided at duct 26.

#### CLAIMS

1. A moulded article which is moulded from an unsaturated resin composition and which is provided with a coating of a powder mould coating material, the unsaturated resin composition being an unsaturated resin composition which is able to be moulded at a low pressure.

2. A moulded article according to claim 1 in which the unsaturated resin composition is a dough moulding compound, a sheet moulding compound, or a bulk moulding compound.

3. A moulded article according to claim 1 or claim 2 in which the article is formed by hot press moulding or by injection moulding.

4. A moulded article according to any one of the preceding claims in which the unsaturated resin composition is a polyester unsaturated resin composition.

5. A moulded article according to claim 4 in which the polyester unsaturated resin composition comprises solid polyester resins blended with styrenated polyesters.

6. A moulded article according to any one of the preceding claims and including reinforcing materials, additives, fillers and catalysts.

7. A moulded article according to claim 6 in

which the additives are shrink control additives.

8. A moulded article according to any one of the preceding claims in which the unsaturated resin composition contains an unsaturated polymer, a vinyl monomer and a thickener, the thickener being a crystalline polyester.

9. A moulded article according to claim 8 in which at least a part of the acid of the crystalline polyester is fumaric acid.

10. A moulded article according to claim 8 or claim 9 in which the amount of crystalline polyester present in the unsaturated resin composition is from 10 to 50% by weight of the total weight of the composition.

11. A moulded article according to any one of the preceding claims in which the powder mould coating material is one or more unsaturated polyester resins.

12. A moulded article according to claim 11 in which the powder mould coating material comprises unsaturated polyester resin, DAP prepolymer and a poly-unsaturated cross-linking agent.

13. A moulded article substantially as herein described with reference to the accompanying drawing.